

NATIONAL BUREAU OF STANDARDS REPORT

10 835

UPHOLSTERED FURNITURE IN FIRE INCIDENTS



U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

NATIONAL BUREAU OF STANDARDS

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April 24, 1972

UPHOLSTERED FURNITURE IN FIRE INCIDENTS

by

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and

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NATIONAL BUREAU OF STANDARDS

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Prepared by

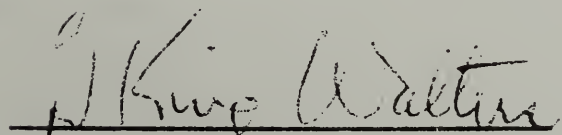
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A handwritten signature in dark ink, reading "G. King Walters", is written over a horizontal line.

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I. INTRODUCTION

The Flammable Fabrics Act, as amended in 1967, requires that the Secretary of Health, Education, and Welfare and the Secretary of Commerce cooperate in a continuing study and investigation of deaths, injuries, and economic losses resulting from accidental burning of fabric products. The Information and Data Section, Fire Technology Division, National Bureau of Standards, Department of Commerce, continually reviews all available fabric fire data to determine and understand the hazards leading to such losses.

The data gathered from public safety organizations and state and local fire departments indicate that upholstered furniture fires constitute an important category of fabric fires and cause major injury and economic losses. But while these reports indicate that a significant fire hazard is presented by upholstered furniture, they do not provide detailed information on the incidents. This report presents a review of the data on the national picture and the findings of a preliminary analysis of the 130 upholstered furniture ignition incidents in the National Bureau of Standards' Flammable Fabrics Accident Case and Testing System (FFACTS). While these 130 incidents are not statistically representative of all such incidents in the country, they are random events investigated without preference and consequently are believed to be representative of the upholstered furniture ignition phenomenon. These incidents exhibit many common characteristics, provide a valuable insight into the nature of the hazard, and establish the relative importance of factors and circumstances in upholstered furniture fires.

II. SUMMARY OF FINDINGS

National Data. A two-year study indicates that "smoking on upholstered furniture" was responsible for over 16 percent of the single-fatality non-clothing fires studied. A 1969 report on fires in Oregon states that 23 percent of the fires involving furniture, furnishings, or clothing, where loss occurred, had upholstered furniture as the first material ignited. In New York State, furniture fabric and furnishings ignitions constituted over 21 percent of the casualties and 17 percent of the deaths caused by fabric ignitions reported in 1970.

FFACTS Data. Upholstered furniture was the first fabric product ignited in over 80 percent of the reported incidents in which such furniture was involved. Cigarettes and unknown smoking materials accounted for over 85 percent of the first-to-ignite upholstered furniture incidents. Of the 118 persons directly involved in the incidents, 91 persons became involved as a result of their own or someone else's smoking.

The victims of upholstered furniture incidents are both men and women, in about equal numbers, but both are predominantly of smoking age. Those 20 years old and younger are strikingly under-represented.

Of the 118 persons directly involved in these incidents, 74 were injured - 33 fatally. Upholstered furniture incidents show a fatality-to-injury ratio of about 45 percent, and constitute the most hazardous category of fabric fires in the FFACT System. A large portion of fatalities is attributable to smoke and gas inhalation.

One-half of those directly involved in upholstered furniture incidents were alone during the entire incident; one-fourth were involved with intoxicants; and one-third suffered from some disability. These groups were more seriously injured than those not alone, not intoxicated, or not handicapped.

Private homes or apartments were the locations of 98 percent of the incidents, and the living room was the room in which the fire started in 75 percent of the incidents. Over one-third of the incidents occurred between midnight and 6 a.m.

Lower income level groups are more heavily represented among the victims. The elderly, who generally have lower incomes than the younger group, are highly represented. Housing value distributions for the 130 upholstered furniture incidents, however, are consistent with national figures.

The majority of the outerlayer fabrics involved for which compositions could be determined are cotton, rayon, and cotton-rayon blends. Only incomplete information is available for inner structures of the furniture; however, for those incidents for which information could be obtained, cotton batting predominates, with urethane foam-and-cotton batting systems also significantly represented.

III. THE NATIONAL PICTURE

The National Fire Protection Association (NFPA) has estimated that approximately 12,200 persons died as a result of fires in 1971 and a comparable number in 1970.^{1/} Approximately 6,600 were estimated to have occurred in dwellings. The Department of Health, Education, and Welfare estimates that there are annually 3,000 to 5,000 deaths and 150,000 to 250,000 injuries from burns resulting from fires involving fabrics or related materials.^{2/} HEW has estimated that property damage attributable to fabric fires is over \$250 million annually. It is not known what portion of these losses can be attributed to upholstered furniture fires, but several sources indicate upholstered furniture to be a significant fire hazard.

An NFPA study of single-fatality fires in the U.S., performed between 1966 and 1968, showed that 16 percent of the non-clothing fires which resulted in fatalities, and for which the causes of ignition were known, were caused by smoking on upholstered furniture.^{3/} A partial summary of this data is presented below. An accompanying analysis of these data states: "It is interesting to note that although for many years there has been virorous campaigning against smoking in bed, smoking on upholstered furniture (overstuffed chairs and couches) caused almost as many deaths in non-clothing fires. ^{3/}

^{1/} News release, National Fire Protection Association, dated January 4, 1972.

^{2/} "Third Annual Report to the President and Congress on the Studies of deaths, Injuries, and Economic Losses Resulting from Accidental Burning of Products, Fabrics or Related Materials - FY 1971", DHEW.

^{3/} "The Single-Fatality Fire", Fire Journal, January, 1969, p.34-35.

TABLE 1

CAUSES OF NON-CLOTHING FIRES RESULTING IN FATALITIES

(NFPA 1969)

<u>Causes</u>	<u>Number of Fires</u>	<u>Percent (Subtotal)</u>	<u>Percent (Total)</u>
Smoking on upholstered furniture	237	16.3	9.0
Smoking in bed	307	21.2	11.7
Other careless smoking	61	4.2	2.3
Mishandling flammable liquid	<u>842</u>	<u>58.2</u>	32.1
Subtotal	1447	99.9	
Other	971		37.1
Undetermined	<u>202</u>		<u>7.7</u>
TOTAL	2620		99.9

Another study providing insights on the frequency and severity of upholstered furniture fires is a 1970 report on fires in the State of Oregon. Upholstered furniture was the initial material ignited in 23.4 percent of the fires involving furniture, furnishings or clothing where loss occurred.^{4/} A summary of the Oregon data is presented below.

TABLE 2
ESSENTIAL FIRE CAUSE FACTORS
(Oregon 1970)

<u>Initial Material Ignited</u>	<u>Number of Fires</u>	<u>Percent</u>
Mattress or bedding on bed	419	37.5
Upholstery (davenport, chair, etc.)	262	23.4
Clothing	192	17.2
Rags	78	7.0
Floor coverings	63	5.6
Bedding off bed	54	4.8
Curtains and blinds	48	4.3
Others	<u>2</u>	<u>.2</u>
TOTAL	1118	100.0

^{4/} Annual Statistical Report - 1970, Oregon State Fire Marshall's Office.

In New York State, furniture fabric and furnishings accounted for over 21 percent of the injuries and 17 percent of the deaths caused by fabric ignitions reported in 1970.^{5/} A summary of the New York State data is shown below.

TABLE 3
REPORTED FABRIC IGNITION INJURIES AND DEATHS
(New York 1970)

<u>Fabric Product Category</u>	<u>Injuries</u>		<u>Deaths</u>	
	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>
Clothing	93	36.3	42	43.3
Bedding	95	37.1	34	35.1
Furniture fabric and furnishings	56	21.9	17	17.5
Other (carpeting and combinations)	<u>12</u>	<u>4.7</u>	<u>4</u>	<u>4.1</u>
TOTAL	256	100.0	97	100.0

These and other data indicate a significant fire hazard is presented by upholstered furniture, but they do not provide sufficient detail to obtain an understanding of the upholstered furniture ignition phenomenon. It is with this purpose that the following summary of the upholstered furniture data in the FFACT System is presented.

^{5/} "Reported Flammable Fabric Episodes: 1969-1971", New York State Department of Health, Burns Care Institute Prevention Program.

IV. THE FFACTS DATA BASE

The FFACTS System. The data base of the FFACT System is derived from reports on flammable fabric incidents, largely supplied by the Food and Drug Administration, and the results of laboratory tests on remains of fabric products involved in these accidents. Using report forms developed jointly by the FDA and NBS, FDA investigators from 39 district offices follow and report on accidental fires involving flammable fabric products. Where possible, they also obtain samples of any remains of these products. The reports and the fabric remains collected are forwarded to NBS. If the reports meet the FFACT System requirements of relevance and adequacy, they are analyzed; and the composition, weight, construction, and flammability of the fabric products involved are determined in the laboratory. The reported information is then reviewed in the light of results of the laboratory tests, coded, and entered into the FFACTS computerized data base. Some 200 different data elements can be coded for an incident.

Upholstered Furniture Incidents. As of April 1, 1972, the FFACTS data base contained 1616 incidents. Among them there were 130 separate upholstered furniture incidents, involving directly 118 persons and 149 pieces of furniture. It should be pointed out that upholstered furniture incidents are probably under-represented in FFACTS because the original emphasis of the Food and Drug Administration's collection efforts was primarily on garment fires. The only data on fabric products other than garments received by NBS came from garment ignition cases in which these non-garment fabric items were also involved. For the past year and a half,

however, FDA's efforts have been extended to include bedding and other interior furnishings ignition incidents. As a result, nearly one case history in six received and incorporated in FFACTS has involved upholstered furniture.

Geographic Distribution. The geographic distribution of the 130 upholstered furniture incidents in the data base, shown in Table 4, reflects the regional pattern of FDA's most recent investigative efforts. While over 80 percent of the first 700 incident reports in the FFACTS data base came from FDA study teams in Massachusetts, Iowa, Michigan and Colorado, these four states account for only 24 upholstered furniture cases; moreover, nearly all of the 18 Colorado cases are from recent investigation efforts.

Since the incidents in FFACTS do not represent a statistically valid sample of fabric fires in the United States, full extrapolation of the data to nationwide figures would be improper. However, the data base is of sufficient size to permit the identification of distinctive trends in upholstered furniture ignitions, and in the resulting injuries.

TABLE 4

GEOGRAPHIC DISTRIBUTION OF UPHOLSTERED FURNITURE INCIDENTS

IN FFACTS AS OF APRIL 1, 1972

<u>State</u>	<u>Upholstered Furniture Incidents</u>
California	51
Colorado	18
Illinois	11
New York	7
Ohio	7
Arizona	5
Wisconsin	5
Texas	5
Washington	4
Missouri	3
Massachusetts	3
Michigan	2
District of Columbia	2
Pennsylvania	2
Indiana	2
Oregon	1
Iowa	1
Unknown	<u>1</u>
TOTAL	130

V. IGNITION SEQUENCE

Information on ignition sequence was available for 114 of the 130 upholstered furniture incidents. For 93 or 81 percent of these 114 incidents, the first fabric item to become involved was upholstered furniture. Nearly 70 percent of these 114 incidents involved interior furnishings exclusively. Of the 21 incidents for which it is known that upholstered furniture was not the first item to ignite, eight had other interior furnishings ignite first. Bedding was involved in only 15 incidents, primarily in hide-a-bed ignitions and bedroom conflagrations. Bedding items were first to ignite in six of these incidents. Garments were involved in 33 of the 114 incidents; in seven of these incidents they were the first items involved. Generally, a garment ignition resulted from a victim's falling asleep with a lighted cigarette or dropping a match or cigarette on himself or on a piece of upholstered furniture.

Ignition Sources. The ignition sources for the 93 incidents in which upholstered furniture was first to ignite are listed in Table 5. Cigarettes and unknown smoking materials (which, judging from the circumstances of the incidents, were very likely cigarettes) account for 86 percent of the known ignition incidents.

TABLE 5

IGNITION SOURCES FOR UPHOLSTERED FURNITURE

<u>Ignition Sources</u>	<u>Incidents in Which Upholstered Furniture was First-to-Ignite</u>	<u>Percent</u>
Cigarette	67	77.9
Unknown Smoking Materials*	7	8.1
Matches	3	3.5
Electrical Wiring	3	3.5
Candle	2	2.3
Heater	2	2.3
Cigarette Lighter	1	1.2
Focused Sunrays	<u>1**</u>	<u>1.2</u>
Subtotal	86	100.0
Unknown	<u>7</u>	
TOTAL	93	

* Judging from the circumstances of the incidents, most of the "unknown smoking materials" are very likely cigarettes.

** The upholstery fabric in this case melted but did not flame.

VI. CIRCUMSTANCES PRIOR TO INCIDENT

Several data elements are recorded in FFACTS regarding the circumstances existing just prior to the ignition incident, which could have influenced the actions of a person directly involved and affected the course of the incident. The most important of these are the activity which precipitated the person's involvement, whether he was alone or not, whether he was under the influence of intoxicants or drugs, and whether he had a physical or mental disability which could have played a part in his involvement.

In 14 of the 130 upholstered furniture incidents, there was no direct personal involvement recorded. These include incidents in which upholstered furniture ignited from electrical short circuits, heaters, cigarettes discarded by unknown persons, and unknown sources. This brings the number of personal-involvement incidents to 116. Two incidents, however, involved two victims each; hence the total number of persons directly involved is 118.

Activity. Of the 116 persons directly involved for whom the information is available at least 91, or 77 percent, became involved in the ignition incident as a result of thier own or someone else's smoking. Table 6 lists the activities prior to ignitions of persons directly involved in upholstered furniture incidents.

TABLE 6

ACTIVITY PRIOR TO IGNITION OF PERSONS DIRECTLY INVOLVED IN UPHOLSTERED
FURNITURE INCIDENTS

<u>Activity of Persons Directly Involved</u>	<u>Number of Persons Directly Involved</u>	<u>Percent</u>
Careless Smoking	77	66.4
Sleeping	18*	15.5
Playing with matches, lighter or candle	5	4.3
Using matches or lighter	4	3.4
Having seizure or stroke while smoking	4	3.4
Rescuing other victims	3	2.6
Other	<u>5</u>	<u>4.3</u>
Subtotal	116	99.9
Unknown	<u>2</u>	
TOTAL	118	

*At least 10 of the persons listed as sleeping were the victims of someone else's careless smoking.

Presence of Others. Table 7 shows that almost half of those persons for whom information is available were alone during the entire incident, and half were either not alone or alone only at the time of ignition. Injuries and fatalities are heavily concentrated among those alone during the entire course of the ignition incident. Fifty-seven percent of all injuries and seventy-five percent of all the deaths occurred among those who were entirely alone. There appears to be no significant difference in injury and fatality rates between those not alone and those alone only at the time of ignition.

TABLE 7

PRESENCE OF OTHERS DURING INCIDENT AND NUMBER OF INJURIES AND DEATHS
AMONG PERSONS DIRECTLY INVOLVED IN UPHOLSTERED FURNITURE INCIDENTS

<u>Person</u>	<u>Number of Persons Directly Involved</u>	<u>Number of Injuries</u>	<u>Number of Deaths</u>
Not alone	24	12	3
Alone at ignition only	24	18	4
Alone during entire incident	50	42	25
Unknown	<u>20</u>	<u>2</u>	<u>1</u>
TOTAL	118	74	33

Intoxicants and Drugs. As shown in Table 8, more than one in four victims for whom the information was available was reported under some influence of intoxicants or drugs prior to the accident. More than one victim in three of those involved with intoxicants died as a result of his involvement in an upholstered furniture ignition, as compared to one fatality in four among other persons involved. Injury rates are also slightly higher for those involved with intoxicants.

TABLE 8

INVOLVEMENT WITH INTOXICANTS OR DRUGS AND NUMBER OF INJURIES AND DEATHS AMONG PERSONS DIRECTLY INVOLVED IN UPHOLSTERED FURNITURE INCIDENTS

<u>Intoxicants or Drugs</u>	<u>Number of Persons Directly Involved</u>	<u>Number of Injuries</u>	<u>Number of Deaths</u>
Alcohol	19	15	8
Other Drugs	4	3	1
None	56	37	15
Unknown	<u>39</u>	<u>19</u>	<u>9</u>
TOTAL	118	74	33

Disability. Information on the existence or absence of a disability was available for 78 of the 118 persons directly involved in upholstered furniture incidents. Nearly one in three of these 78 persons had some degree of disability. The 100 percent injury and 56 percent death rates for these disabled victims are exceptionally high compared to the morbidity and mortality rates for other persons directly involved in upholstered furniture incidents, which are 54 percent and 21 percent, respectively. Disabled or handicapped persons, even those whose disability appears relatively mild are less able to escape and are more easily overcome by the smoke and toxic fumes given off by burning upholstered furniture. Table 9 lists the various disabilities and handicaps of persons directly involved in upholstered furniture incidents.

TABLE 9

DISABILITIES AND NUMBER OF INJURIES AND DEATHS AMONG PERSONS DIRECTLY
INVOLVED IN UPHOLSTERED FURNITURE INCIDENTS

<u>Disability or Handicap</u>	<u>Number of Persons Directly Involved</u>	<u>Number of Injuries</u>	<u>Number of Deaths</u>
Partially disabled	11	11	9
Heart condition	3	3	1
Arthritis	2	2	1
Epilepsy	2	2	0
Emphysema	1	1	0
Alcoholic	1	1	0
Broken Arm	1	1	0
Senility	2	2	2
None	55	40	13
Unknown	<u>40</u>	<u>11</u>	<u>7</u>
TOTAL	118	74	33

VII. INJURY AND DAMAGE

Morbidity and Mortality. Of the 118 persons directly involved; 74 were injured. Thirty-three, or 45 percent of those 74, died as a result of their injuries. The data are shown in Table 10. The death rate for injured victims is higher for upholstered furniture ignition accidents than for accidents involving any other fabric item in FFACTS. (For comparison, other high death/injury ratios in FFACTS include the following: mattresses - 35 percent; robes - 34 percent; and nightgowns 29 percent).

Inhalation. Inhalation of smoke and/or toxic gases appears to be the most important single cause of death among the 33 fatalities. One-third of all deaths are ascribed to that cause.

Burns. The FFACT system contains information on the full thickness and total burn areas resulting from flammable fabric incidents. Such data for the 61 victims of upholstered furniture incidents who are known to have sustained burns are shown in Table 11. It should be pointed out that this area-of-burn information may be based on initial, sometimes inaccurate estimates. But for many types of fabric products, particularly garments, involved in ignition incidents, the total area of burn and area of full thickness burn sustained by the victim are good indicators of the hazard presented by the fabric product. However, for victims of upholstered furniture incidents, the relationship between area of burn recorded in FFACTS and the hazard presented by the upholstered furniture is questionable.

It is characteristic for an upholstered furniture incident that the area of body burned depends largely on the victim's ability to escape before being overcome by smoke. Many persons directly involved in such incidents awake in time and escape with little or no burns. Many others are overcome by smoke and die before the flames reach them.

TABLE 10

BURN AND INHALATION INJURIES OF PERSONS DIRECTLY INVOLVED IN
UPHOLSTERED FURNITURE INCIDENTS, AND CAUSES OF DEATH

<u>Personal Injury</u>	<u>Number of Persons Directly Involved</u>	<u>Percent</u>
Yes	74	62.7
No	<u>44</u>	<u>37.3</u>
TOTAL	118	100.0

<u>Burns</u>	<u>Number of Victims</u>	<u>Percent</u>
Yes	61	82.4
No	<u>13</u>	<u>17.6</u>
TOTAL	74	100.0

<u>Inhalation</u>	<u>Number of Victims</u>	<u>Percent</u>
Yes	38	76.0
No	<u>12</u>	<u>24.0</u>
Subtotal	50	100.0
Unknown	<u>24</u>	
TOTAL	74	

<u>Deaths</u>	<u>Number of Victims</u>	<u>Percent</u>
Yes	33	44.6
No	<u>41</u>	<u>55.4</u>
TOTAL	74	100.0

TABLE 10 (con't)

<u>Cause of Death</u>	<u>Number of Fatalities</u>	<u>Percent</u>
Inhalation Only	10	33.3
Burn Only	6	20.0
Inhalation and Burns	7	23.3
Heart Attack (due to burns)	3	10.0
Burns and Shock	2	6.7
Burns and Overdose	1	3.3
Burns and Illness	<u>1</u>	<u>3.3</u>
Subtotal	30	99.9
Unknown	<u>3</u>	
TOTAL	33	

TABLE 11
AREA OF BODY BURNED FOR VICTIMS OF
UPHOLSTERED FURNITURE INCIDENTS

<u>Total Area of Body Burned</u>	<u>Number of Burned Victims</u>	<u>Percent</u>
1 - 10%	27	44.2
11 - 50%	17	27.9
Over 50%	<u>17</u>	<u>27.9</u>
TOTAL	61	100.0

Area of Full Thickness Burn

0%	26	52.0
1 - 10%	15	30.0
11 - 50%	6	12.0
Over 50%	<u>3</u>	<u>6.0</u>
Subtotal	50	100.0
Unknown	<u>11</u>	
TOTAL	61	

Disposition of Victim and Hospital Confinement. The data on the disposition of the victims and the length of hospital confinements, shown in Table 12, are more instructive than the data on area of burn. Only about 10 percent of victims of upholstered furniture incidents required no treatment or first aid treatment only; only about 20 percent were released after a treatment in a hospital. About 45 percent were admitted to hospitals, and more than a third of these died after admission; over 25 percent of the victims were dead on arrival in the hospital. Of those 20 victims who were hospitalized and whose confinement did not end in death, four were confined for five days or less, another four for from six to 10 days, five for from 11 to 40 days, and the remaining four for from 41 to 100 days. Total hospital confinement is not known for three of the hospitalized victims.

TABLE 12

DISPOSITION AND HOSPITAL CONFINEMENT OF
VICTIMS OF UPHOLSTERED FURNITURE INCIDENTS

<u>Disposition of Victims</u>	<u>Number of Victims</u>	<u>Percent</u>
Dead on Arrival	19	25.7
Admitted to Hospital		
- Died in Hospital	14	18.9
- Survived	20	27.0
Treated and Released	13	17.6
First Aid Only	6	8.1
No Treatment Required	<u>2</u>	<u>2.7</u>
TOTAL	74	100.0

TABLE 12 (con't)

<u>Days in Hospital</u>	<u>Number of Hospitalized Victims</u>	<u>Percent</u>
1-5	11 (7 deaths)	37.9
6-10	8 (4 deaths)	27.6
11-20	4 (1 death)	13.8
21-40	2	6.9
41-60	2	6.9
61-80	1	3.4
81-100	1	3.4
Over 100	<u>0</u>	<u>0.0</u>
Subtotal	29	99.9
Unknown	<u>5</u> (2 deaths)	
TOTAL	34	

NOTE: Three victims were still hospitalized when the reports were filed. At the time the reports were filled, one had been confined for 56 days, one for 28 days, and one for 11 days.

Property Damage. Property damage in upholstered furniture ignition incidents is significant. Very often the entire room in which the furniture ignited was destroyed; sometimes the entire house. Property damage estimates were reported for 55 of the 130 incidents. These ranged from \$5.00 to \$45,000, for a total of \$176,300, and an average loss per incident of \$3,205.

VIII. PERSONAL DATA

Age. The group of 118 persons directly involved in upholstered furniture incidents shows an uneven age distribution, with a disproportionately large number of older people. The age groups representing the younger 50 percent of the U.S. population represent only 20 percent of these 118 persons. Analysis shows that those 20 years old or less, an age group which makes up 40 percent of U.S. population, account for only 8 percent of those directly involved. Those 21 years old and older, who make up 60 percent of U.S. population, account for 92 percent of the persons directly involved in upholstered furniture incidents. This distribution, shown in Table 13, may well be attributable to cigarette smoking.

On the surface there appears to be an obvious similarity between upholstered furniture and bedding incidents, in which cigarettes are also the major ignition source. However, children playing with matches and lighters are significantly represented in bedding incidents, while they are almost absent in upholstered furniture incidents. It is tempting to speculate that this may be the result of a relative difficulty in igniting upholstery fabrics with a small flame as compared with igniting sheets, bedspreads, and blankets. The close bedding/upholstered furniture fire experience similarities do, however, occur in the older age groups, for which cigarettes are the major ignition source.

TABLE 13

AGE DISTRIBUTION OF PERSONS DIRECTLY INVOLVED IN
UPHOLSTERED FURNITURE INCIDENTS

<u>Age Group *</u>	<u>Number of Persons Directly Involved</u>	<u>Percent</u>
0-5	5	4.3
6-10	0	0.0
11-15	3	2.6
16-20	1	.9
21-26	14	12.1
27-35	9	7.7
36-45	18	15.5
46-55	22	19.0
56-65	18	15.5
66 and older	<u>26</u>	<u>22.4</u>
Subtotal	116	100.0
Unknown	<u>2</u>	
TOTAL	118	

* Each of the above age groups represents approximately 10% of the 1970
U.S. population

Sex. The sex distribution is fairly even over the entire age range. Of the 118 persons directly involved in upholstered furniture incidents 61, or 51.7 percent, were male, and 57, or 48.3 percent were female.

Income. The household income distribution is given in Table 14. The upholstered furniture fires in FFACTS appear to be more prevalent among lower middle and low income groups than would be expected if these data were representative of the national household income distribution based on 1969 Census. As it is noted in the next section, this concentration in the lower income ranges is related to the large number of older people involved, who in general have lower household incomes than people in the younger age groups.

TABLE 14

HOUSEHOLD INCOMES FOR PERSONS DIRECTLY
INVOLVED IN UPHOLSTERED FURNITURE INCIDENTS

<u>Household Income</u>	<u>Incidents</u>	<u>Percent</u>	<u>1969 National Household Income Distribution Percent</u>
Under \$3,000	14	20.3	9.3
\$3,000 - \$5,000	19	27.5	10.7
\$5,001 - \$10,000	21	30.4	34.0
\$10,001-\$15,000	11	15.9	26.7
Over \$15,000	<u>4</u>	<u>5.8</u>	<u>19.2</u>
Subtotal	69	99.9	99.9
Unknown	<u>58</u>		
TOTAL	127*		

* Three incidents did not take place in a private dwelling and were not considered.

Home Value/Monthly Rent. The home values or monthly rents for the 116 households for which such information was available are listed in Table 15. Unlike the household income distribution, the home value distribution very closely parallels the national home value distribution from 1969 Census data, and the monthly rent distribution also approximates the national figures with only a slight under-representation in the lowest ranges. These close correlations between the FFACTS data and the national data would tend to indicate that the 130 incidents are fairly representative of upholstered furniture incidents. This would tend to show that upholstered furniture incidents occur rather uniformly across all economic ranges.

A likely explanation for the close parallels for home value/monthly rent and the disproportionate concentration of low household incomes is the fact that the age distribution is so heavily weighted towards older people. It is common for older people to have lower incomes and continue to live in housing of the same standard as before they retired or grew older.

TABLE 15

HOME VALUE AND MONTHLY RENT DISTRIBUTIONS FOR PERSONS
DIRECTLY INVOLVED IN UPHOLSTERED FURNITURE INCIDENTS

<u>Home Value</u>	<u>Number of Incidents</u>	<u>Percent</u>	<u>1969 Home Value Distribution Percent</u>
Less than \$5,000	4	8.3	7
\$5,000 - \$14,999	17	35.4	38
\$15,000-\$19,999	11	22.9	20
\$20,000-\$24,999	8	16.7	15
\$25,000 and over	<u>8</u>	<u>16.7</u>	<u>20</u>
Subtotal	48	100.0	100

<u>Monthly Rent</u>	<u>Number of Incidents</u>	<u>Percent</u>	<u>1969 Monthly Rent Distribution Percent</u>
Less than \$40	2	2.9	9
\$40 - \$59	6	8.8	15
\$60 - \$99	27	39.7	39
\$100-\$149	26	38.2	27
\$150 and over	<u>7</u>	<u>10.3</u>	<u>10</u>
Subtotal	68	99.9	100

Unknown 11

TOTAL 127 *

* Three incidents did not take place in a private dwelling and were not considered.

IX. LOCATION

House and Room. All but 3 of the 130 upholstered furniture incidents in FFACTS occurred in private dwellings, with 3 out of 4 in houses. Three out of four incidents originated in the living room, with the bedroom the only other room reported as the place or origin for a significant number of incidents. This distribution appears to follow the usage pattern one would expect for pieces of upholstered furniture. Table 16 shows these numbers.

TABLE 16

GENERAL AND SPECIFIC LOCATIONS OF UPHOLSTERED FURNITURE INCIDENTS

<u>General Location of Incident</u>	<u>Number of Incidents</u>	<u>Percent</u>
Private Home (owned or rented)	99	76.2
Apartment	25	19.2
Mobile Home	3	2.3
Hospital	2 *	1.5
Dormitory	<u>1</u>	<u>.8</u>
TOTAL	130	100.0

<u>Specific Location of Ignition</u>	<u>Number of Incidents</u>	<u>Percent</u>
Living Room	97	74.6
Bedroom	14	10.8
Basement	2	1.5
Den	2	1.5
Porch/Patio	2	1.5
Kitchen	2	1.5
Garage	2	1.5
All Others	<u>9</u>	<u>6.9</u>
TOTAL	130	99.8

* Both the hospital fires occurred in waiting rooms.

X. MONTH AND TIME OF INCIDENT

The monthly distribution of the 130 upholstered furniture incidents in FFACTS is heavily skewed toward the last five months of the year. This fact is not considered significant, however, because it is almost entirely the result of accelerated data collection efforts of FDA during the last five months of 1970. A more representative data collection procedure and subsequent analysis could presumably produce some indication of seasonal variations in the frequency of upholstered furniture incidents.

The data on time of discovery of ignition are shown in Table 17. More than one third of the upholstered furniture ignition discoveries occurred between midnight and 6 a.m. Many smoldered for several hours before being discovered. The high frequency of incidents in this time period, which is peculiar to both bedding and upholstered furniture ignitions, indicates the danger that in many upholstered furniture incidents toxic levels of smoke can be produced while the occupants of the household are asleep.

TABLE 17

DISTRIBUTION OF UPHOLSTERED FURNITURE INCIDENTS BY TIME OF DISCOVERY

<u>Time of Day</u>	<u>Number of Incidents</u>	<u>Percent</u>
12:01 a.m. to 6:00 a.m.	45	35.7
6:01 a.m. to 12:00 noon	23	18.3
12:01 p.m. to 6:00 p.m.	30	23.8
6:01 p.m. to 12:00 midnight	<u>28</u>	<u>22.2</u>
Subtotal	126	100.0
Unknown	<u>4</u>	
TOTAL	130	

XI. FABRIC PRODUCT IDENTIFICATION

Outer Fabric. Of the 149 pieces of upholstered furniture involved in the 130 incidents partial or full samples of only 71 peices were received and examined by NBS. The fiber content was determined in the laboratory for these 71 samples; in addition, information on the fiber content of the outermost fabric layer was furnished in the reports for 23 pieces for which no samples were received. These fiber contents are often only the investigator's or interviewee's opinion; therefore, these data are recorded separately in Table 18. Cotton, rayon, and cotton/rayon blends account for more than 50 percent of the total outer layer fabrics.

TABLE 18

THE FIBER CONTENT OF OUTER FABRIC LAYER
OF UPHOLSTERED FURNITURE INVOLVED IN FIRE INCIDENTS

<u>Fiber Content of Outer Layer</u>	Number of pieces of Upholstered Furniture			
	<u>From NBS Tests</u>	<u>Percent</u>	<u>From Case History Reports</u>	<u>Total</u>
Cotton	12	16.9	8	20
Cotton/Rayon	17	23.9	1	18
Rayon	13	18.3	0	13
Vinyl	5	7.0	1	6
Nylon	1	1.4	3	4
Cotton/Rayon/Nylon	3	4.2	1	4
Cotton/Rayon/Metallic	3	4.2	0	3
Cotton/Rayon/Acetate	3	4.2	0	3
Cotton/Nylon	3	4.2	0	2
Cotton/Rayon/Wool	2	2.8	0	2
Cotton/Linen	2	2.8	0	2
Rayon/Olefin	1	1.4	0	1
Rayon/Nylon	1	1.4	0	1
Rayon/Cotton/Linen	1	1.4	0	1
Nylon/Cotton/Metallic	1	1.4	0	1
Rayon/Acetate	1	1.4	0	1
Cotton/Wool/Acetate	1	1.4	0	1
Leather	1	1.4	0	1
Wool	0	-	1	1
Cotton/Wool	0	-	1	1
Cotton/Unknown Synthetic/Metallic	0	-	1	1
Cotton/Unknown Synthetic	0	-	1	1
Unknown Synthetic	0	-	5	5
Unknown	<u>0</u>	<u>-</u>	<u>55</u>	<u>55</u>
TOTAL	71	99.7	78	149

The samples of 9 of the outer fabric layers (upholstery) received were too small for fabric weight analysis. The weights of the 62 specimens tested are distributed fairly evenly from 5 to 25 ounces per square yard. These data are presented in Table 19.

TABLE 19

DISTRIBUTION OF FABRIC WEIGHT FOR THE OUTER FABRIC LAYER
OF UPHOLSTERED FURNITURE INVOLVED IN FIRE INCIDENTS

<u>Fabric Weight (oz/yd²)</u>	<u>Number of Samples Received</u>	<u>Percent</u>
Under 5.1	0	0.0
5.1 - 7.0	8	12.9
7.1 - 9.0	6	9.7
9.1 - 11.0	10	16.1
11.1 - 13.0	9	14.5
13.1 - 15.0	6	9.7
15.1 - 17.0	6	9.7
17.1 - 19.0	6	9.7
19.1 - 21.0	3	4.8
Over 21.0	<u>8</u>	<u>12.9</u>
Subtotal	62	100.0
Unknown (too small for testing)	<u>9</u>	
TOTAL	71	

Inner Layers. Many of the inner layer samples received were incomplete or in disconnected order; many other samples did not include inner layers at all. Again, information derived from reports is listed separately from NBS test data. The data are shown in Table 20. Since smoke and toxic gases generated primarily from the stuffing present the greatest hazard in upholstered furniture incidents, it would be valuable to investigate correlations between inner layer fiber contents and type and severity injuries. However, because of the incompleteness of many of the samples and the disturbed order of battings and foams, such correlations could not be made.

TABLE 20

COMPOSITION OF INNER LAYERS OF UPHOLSTERED FURNITURE

INVOLVED IN FIRE INCIDENTS

Number of Pieces of Upholstered Furniture

<u>Fiber Content of Inner Layers</u>	<u>From NBS Tests</u>	<u>Percent</u>	<u>From Case History Reports</u>	<u>Total</u>
Cotton Batting	24	41.4	5	29
Cotton Batting & Jute	12	20.7	0	12
Urethane Foam & Cotton Batting	8	13.8	0	8
Foam Rubber	1	1.7	2	3
Cotton Batting, Sisal & Jute	2	3.5	0	2
Urethane Foam	1	1.7	0	1
Urethane, Polyester Batting & Cotton Batting	1	1.7	0	1
Urethane, Cotton Batting, Urethane & Sisal	1	1.7	0	1
Urethane & Jute	1	1.7	0	1
Polyester Batting	1	1.7	0	1
Polyester Batting, Urethane & Cotton Batting	1	1.7	0	1
Cotton & Foam Rubber	1	1.7	0	1
Foam Rubber, Cotton Batting & Jute	1	1.7	0	1
Cotton Batting, Sisal & Rubberized Hair	1	1.7	0	1
Cotton Batting, Foam Rubber & Jute	1	1.7	0	1
Jute	1	1.7	0	1
Unknown	<u>0</u>	<u>-</u>	<u>84</u>	<u>84</u>
TOTAL	58	99.8	91	149

XII. CONCLUSION

On the basis of the analysis of available data, it can be concluded that:

1. Upholstered furniture constitutes a flammability hazard.
2. Cigarettes constitute the dominant ignition source leading to upholstered furniture ignition incidents.

Accordingly, upholstered furniture fabric products appear to warrant further investigation in pursuance of the Flammable Fabrics Act. It also appears from the data that any standard that may be developed for upholstered furniture under the Act should employ a test method which simulates cigarette ignition.

